

**Before the
Federal Communications Commission
Washington, DC 20554**

In the Matter of)	
)	
Reassessment of the Federal Communications)	ET Docket No. 13-84
Commission Radiofrequency Exposure Limits)	
And Policies)	
)	
Proposed Changes in the Commission's Rules)	ET Docket No. 03-137
Regarding Human Exposure to Radiofrequency)	
Electromagnetic Fields)	

COMMENTS OF JULIAN GEHMAN URGING USE OF SAR ABOVE 6 GHz

Julian Gehman, a telecommunications lawyer, hereby submits these Comments in response to the Commission's Notice of Inquiry (NOI)¹. The NOI solicits research on the adequacy of the Commission's current radiofrequency (RF) exposure limits for human health and safety.

Attached hereto as Exhibit A is a research paper (the "Nasim & Kim paper") on the effect of human exposure to 5G downlink transmissions.² This paper projects that a typical 5G installation configured according to 3GPP Release 15 could result in a specific absorption rate (SAR) of four to 300 watts per kilogram on the 5G downlink.³ Such an exposure would far exceed the Commission's SAR limit for frequencies under 6 GHz.⁴ The Commission should place the Nasim & Kim paper on public notice and solicit comments by interested parties, so that the authors' assumptions and calculations can be confirmed.⁵

¹ *In the Matter of Reassessment of the Federal Communications Commission Radiofrequency Exposure Limits And Policies; Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields*, First Report and Order, Further Notice of Proposed Rulemaking, and Notice of Inquiry, ET Docket Nos. 13-184, 03-137, para. 205 (Mar 29, 2013).

² Intiaz Nasim and Seungmo Kim, *Mitigation of Human EMF Exposure in 5G Downlink*, Oct 24, 2018, <https://arxiv.org/pdf/1807.09094.pdf> (viewed Jan 31, 2019). It should be noted that the Nasim & Kim paper is limited to an 8X8 antennae array for 5G and does not study a 16X16 array, where presumably the effect could be more pronounced.

³ *Id.*

⁴ The FCC's SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a volume in the shape of a cube), subject to certain exceptions. 47 C.F.R. 1.1310(c).

⁵ Many previous RF investigations examined the health effects of a mobile device used near the human body. These could be characterized as examining the uplink or near-field. Nasim and Kim calculate the RF effects of a 5G downlink or far-field, from the transmitter array to humans.

If the Nasim & Kim paper is born out, the Commission's assumptions regarding how to measure RF from 5G systems may need to be re-examined. As the Commission is well aware, 5G is different in a number of respects: small cell sites covering a radius of 100 meters each, these cell sites are located closer to and interspersed within the population, each cell site will have a large number of antennae (distributed antenna systems, multiple input multiple output, etc.) and will perform beam forming to shape more sharply pointed RF emissions. Finally, the millimeter wave antennae will operate on higher frequencies and utilize much more bandwidth. Because of beam forming, greater bandwidth and closer proximity, 5G systems are projected to deliver signal strength and data transmission capacity that far exceeds that of 4G systems. These enhanced capabilities have implications for RF safety, as measured by the SAR.

SAR is a "measure of the rate at which energy is absorbed by the human body when exposed to a radio frequency electromagnetic field. . . . It is defined as the power absorbed per mass of tissue and has units of watts per kilogram."⁶ SAR measures thermal heat, *i.e.*, the capacity to burn skin and other human tissue. The FCC uses SAR to evaluate the impact of human exposure to RF radiation for frequencies below 6 GHz.⁷ For frequencies above 6 GHz, the Commission states that it relies on power density (PD) instead of SAR because "energy deposition would occur primarily on the surface of the skin, so an SAR-average over a one centimeter depth of tissue (corresponding to a 1 gram cube) would not be appropriate."⁸ Nasim and Kim respond to this by noting that "recent studies found that PD is not as useful as SAR or temperature exposure in assessment since SAR can display the level of EMF energy that is actually 'absorbed' in the body [] while PD cannot."⁹ This argues for the FCC establishing a limit on SAR in addition to its existing limit on PD.

Put simplistically, a burn is a burn. Prolonged human exposure to the SAR of four to 300 w/kg, that is projected by Nasim & Kim, would result in serious injury and possibly death. It does not matter to the victim whether the EMF energy comes from frequencies below or above 6 GHz.

⁶ https://en.wikipedia.org/wiki/Specific_absorption_rate (visited Jan 30, 2019).

⁷ 47 C.F.R. 1.1310(a).

⁸ *Supra*, n1, para 24, n48.

⁹ Nasim & Kim, *supra* n2 at 2 (citing studies).

WHEREFORE, it is respectfully requested that (1) the Nasim & Kim paper be placed on public notice and comments solicited so that their assumptions and calculations can be confirmed, and (2) the Commission establish an SAR standard for frequencies above 6 GHz.

Respectfully submitted,

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/s/ Julian Gehman

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Attachment:

Exhibit A Imtiaz Nasim and Seungmo Kim, Mitigation of Human EMF Exposure in 5G Downlink, Oct 24, 2018, <https://arxiv.org/pdf/1807.09094.pdf> (viewed Jan 31, 2019).